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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,355	03/30/2004	Hongyu Yue	071469-0307699	4102

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EXAMINER
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CHEN, KIN CHAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 06/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/812,355

Applicant(s)

YUE, HONGYU

Examiner

Kin-Chan Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5 and 7-15 is/are pending in the application.
- 4a) Of the above claim(s) 14 and 15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>02082006</u>  | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of claims 1-5 and 7-13, cancellation of claim 6, and withdrawal of claims 14 and 15 are acknowledged. The traversal is on the ground(s) that claims 14 and 15 (group II) sufficiently overlaps the search and examination of the subject matter of group I (claims 1-5 and 7-13). This is not found persuasive because the apparatus as claimed can be used to practice another and materially different process such as vapor deposition process. Besides, the method of group I and the apparatus of the group II are under different classifications and involve different search (e.g., applicant may amend the apparatus claims by adding various apparatus features and limitations during the prosecution) that would be a serious burden on the examiner. The requirement is still deemed proper and is therefore made FINAL. A complete reply to the following rejection must include cancellation of nonelected claims or other appropriate action.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been

obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-5 and 7-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoyasu et al. (US 2004/0185583; hereinafter "Tomoyasu").

Applicant states that the instant application is assigned to Tokyo Electron Limited by an assignment filed June 24, 2004 is acknowledged. The fact that the reference and the application have the same assignee is **not**, by itself, sufficient evidence. The common ownership must be "at the time the invention was made." Since the assignment of June 24, 2004 is later than the application's filing date, it is not sufficient to overcome the rejection.

In a method for chemical oxide removal, Tomoyasu (abstract; ([0007], [0059], [0074], [0200]; Fig. 2) teaches that a chemical oxide removal process may be performed using a process recipe including a first reactant, a second reactant, and a process pressure in order to acquire trim amount data as a function of a variable parameter. Tomoyasu (abstract; ([0007], [0059], [0074], [0200]; Fig. 2) teaches that a process recipe including setting an amount of a first reactant, a second reactant such as NH<sub>3</sub>, HF, H<sub>2</sub>, O<sub>2</sub>, CO, CO<sub>2</sub>, Ar, He, see [0200]. Hence, it would have been obvious to one with ordinary skill in the art to **use these gases and combinations thereof**. Tomoyasu [0007, lines 4-5] teaches setting an amount of an inert gas in order to achieve the trim amount.

Tomoyasu [0007, lines 4-5] teaches adjusting one or more chemical processing parameters, therefore, it reads on applicant's "maintaining at least one constant parameter constant". Tomoyasu teaches the claimed variable parameters. Tomoyasu

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([0007], [0074]) teaches that the etch rate model (which is a function of variable parameters) can be used along with a processing time to computer an etch depth (so-called target trim amount in the instant claims) which is considered to read on applicant's "using the target trim amount and the relationship to determine a target value for the variable parameter". Tomoyasu teaches changing process pressure and chemical treatment gas flow rates (e.g., gas flow rates of HF, NH<sub>3</sub>, or inert gas), which are proportional to partial pressure (or a mole fraction) of each reactant, therefore, it is considered to read on instant claims 2 and 3. Tomoyasu also teaches thermally treating the substrate and rinsing the substrate following the chemical treating. Tomoyasu ([0007], [0074]) teaches adjusting the amount of inert gas (gas flow rate) in order to remove the desired amount of the chemical oxide. Tomoyasu teaches using charts, and various models for analysis. Tomoyasu clearly shows that process parameters and composition of chemical treatment gases are result-effective variables. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, a person having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using different process parameters and compositions) to obtain optimal result with a reasonable expectation of success.

**Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical ( i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). *In re Woodruff*, 16USPQ2d 1934,1936 (Fed. Cir.1990); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II.**

As to dependent claim 10, see [0062].

As to dependent claims 11 and 12, see [0041] and [0074].

4. Claims 1-3 and 7-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle et al. (US 2004/0097047; hereinafter "Natzle") in view of Tomoyasu et al. (US 2004/0185583) or Newton et al. (US 2004/0099377).

In a method for chemical oxide removal, Natzle ([0014], [0037],[0038], [0042]-[0044]) teaches that a chemical oxide removal process may be performed using a process recipe including a first reactant , a second reactant, and a process pressure.. Natzle [0042] teaches acquiring trim amount data as a function of variable parameters (such as temperature, composition, residence time pressure of the reactant, the amount of reactant or the rate of reactant), **all of which can be regulated**, which is considered to read on applicant's " maintaining at least one constant parameter constant". Natzle [0042] also discloses that the aforementioned variable parameters influence the amount removed. Therefore, it would have been obvious to one with ordinary skill in the art to use the target trim amount and the relationship to determine a target value for the variable parameter". The instantly claimed invention differs from Natzle by specifying well-known features (such as adding inert gas to the etchant) to the art of semiconductor device fabrication. In a method for chemical oxide removal, Tomoyasu teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of treatment gases such as NH<sub>3</sub>, HF, H<sub>2</sub>, O<sub>2</sub>, CO, CO<sub>2</sub>, Ar, He, see [0200]. In a method for chemical oxide removal, Newton ([0073],[0074]), teaches that a chemical oxide removal process may be performed using

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a process recipe including setting an amount of a first reactant, a second reactant, and inert gas (e.g., HF, NH<sub>3</sub>, or inert gas). Newton teaches setting an amount of an inert gas in order to achieve the trim amount. Because it is a well-known feature in the art of semiconductor device fabrication and because it is disclosed by Tomoyasu or Newton, hence, it would have been obvious to one with ordinary skill in the art to incorporate inert gas in the process of Natzle, in order to efficiently remove the chemical oxide.

The aforementioned references clearly show that process parameters and composition of chemical treatment gases are result-effective variables. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, a person having ordinary skill in the art would have found it obvious to modify the prior art by performing routine experiments (by using different process parameters and compositions) to obtain optimal result with a reasonable expectation of success.

**Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical ( i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). *In re Woodruff*, 16USPQ2d 1934,1936 (Fed. Cir.1990); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II.**

Natzle teaches changing pressure of reactant and flow rates, which are proportional to partial pressure (or a mole fraction) of each reactant according to the basic physics principles, therefore, the combined prior art is considered to read on instant claims 2 and 3.

As to dependent claim 10, see [0014] of Natzle.

As to dependent claims 11 and 12, after gathering information of etching rates, thickness, process parameters), it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common statistical methods (such as regression, extrapolation, best-fit, polynomial, least squares, interpolation) and numerical analysis. It is noted that applicant did not traverse the aforementioned conventionality (e.g., common knowledge), which have been stated in the previous office action (January 12, 2006).

5. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle in view of Tomoyasu or Newton as applied to claim 1 above, and further in view of Doris et al. (US 2004/0241981; hereinafter "Doris").

The discussion of modified Natzle (in view of Tomoyasu or Newton) from above is repeated here.

The modified Natzle (in view of Tomoyasu or Newton) is silent about the heating and rinsing with water after the chemical treating. In a method for chemical oxide removing, Doris teaches heating and rinsing with water after the chemical treating so as to efficiently remove the solid reaction product, see [0046]. Hence, it would have been obvious to one with ordinary skill in the art to modify Natzle (in view of Tomoyasu or Newton) by heating and rinsing with water as taught by Doris in order to efficiently remove the solid reaction product.

### ***Response to Arguments***



6. Applicant's arguments filed May 11, 2006 have been fully considered but they are not persuasive.

Applicant has argued that Tomoyasu teaches a process gas comprising two gases but not teaches a first process gas, a second gas, and an inert gas. It is not persuasive. As has been stated in the office action, Tomoyasu (abstract; ([0007], [0059],[0074], [0200]; Fig. 2) teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first reactant , a second reactant such as  $\text{NH}_3$ , HF,  $\text{H}_2$ ,  $\text{O}_2$ , CO,  $\text{CO}_2$ , Ar, He, see [0200]. Hence, it would have been obvious to one with ordinary skill in the art to **use these gases and combinations thereof** .

Applicant has request the examiner to show the evidence of the use of inert gas with process gas in a chemical oxide removal process to remove a trim amount is well known. As has been stated in the office action, Tomoyasu teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of treatment gases such as  $\text{NH}_3$ , HF,  $\text{H}_2$ ,  $\text{O}_2$ , CO,  $\text{CO}_2$ , Ar, He, see [0200]. In a method for chemical oxide removal, Newton ([0073],[0074]), teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first reactant, a second reactant, and inert gas (e.g., HF,  $\text{NH}_3$ , or inert gas).

### ***Conclusion***

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For

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more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*June 5, 2006*

A handwritten signature in black ink, appearing to read 'K. Chen', with a stylized flourish extending to the right.

Kin-Chan Chen  
Primary Examiner  
Art Unit 1765